

Current amended set of claims, resubmitted 6-21-04:

1. (currently amended) A method for bonding a first substrate surface to a second substrate surface said first substrate surface being different than said second substrate, comprising:

- (a) providing a catalyst at the first substrate surface said catalyst being diluted in a liquid carrier containing water;
- (b) providing a metathesizable material between the first substrate surface and the second substrate surface ~~or providing a metathesizable material as a component of the second substrate;~~ and
- (c) contacting the catalyst on the first substrate surface with the metathesizable material so that the metathesizable material undergoes a metathesis reaction at normal ambient conditions without an external energy source and bonds the first substrate surface to the second substrate surface.

2. (currently amended) A method according to claim 1 wherein ~~at least~~ one of the substrates comprises an elastomeric material.

3. (original) A method according to claim 2 wherein the elastomeric material is a thermoplastic elastomer.

4. (original) A method according to claim 1 wherein one of the first or second substrates comprises a metallic material and the other first or second substrate comprises an elastomeric material.

5. (original) A method according to claim 4 wherein the metallic material comprises steel and the elastomeric material is selected from natural rubber, polychloroprene, polybutadiene, polyisoprene, styrene-butadiene copolymer rubber, acrylonitrile-butadiene copolymer rubber, ethylene-propylene copolymer rubber, ethylene-propylene-diene terpolymer rubber, butyl rubber, brominated butyl rubber, alkylated chlorosulfonated polyethylene rubber,

hydrogenated nitrile rubber, silicone rubber, fluorosilicone rubber, poly(n-butyl acrylate), thermoplastic elastomer and mixtures thereof.

6. (withdrawn) A method according to claim 1 wherein the first substrate comprises a tire carcass and the second substrate comprises a tire tread.

7. (original) A method according to claim 1 wherein step (b) comprises applying the metathesizable material to the second substrate surface and step (c) comprises contacting the catalyst on the first substrate surface and the metathesizable material-applied second substrate surface.

8. (original) A method according to claim 1 wherein at least one of the substrates is substantially cured elastomeric material.

9. (original) A method according to claim 4 wherein the elastomeric material is substantially cured.

10. (canceled)

11. (original) A method according to claim 1 wherein steps (a)-(c) occur at room temperature.

12. (withdrawn) A method according to claim 6 wherein the bonding in step (c) occurs within one hour.

13. (original) A method according to claim 1 wherein step (a) comprises applying a catalyst onto the first substrate surface.

14. (original) A method according to claim 13 wherein the catalyst is dissolved or mixed into a liquid carrier fluid.

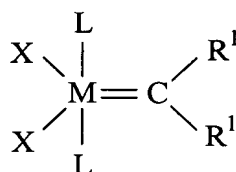
15. (original) A method according to claim 13 wherein the catalyst is included as a component in a multi-component composition.
16. (original) A method according to claim 1 wherein the catalyst is included as a component of the first substrate.
17. (original) A method according to claim 7 wherein the metathesizable material is in the form of a liquid, paste or meltable solid.
18. (original) A method according to claim 7 wherein the metathesizable material is included as a component in a multi-component composition.
19. (withdrawn) A method according to claim 1 wherein the metathesizable material is included as a component of the second substrate.
20. (currently amended) A method for bonding a metallic substrate surface to an elastomeric substrate surface comprising:
- (a) applying a catalyst to the metallic substrate surface said catalyst being diluted in a liquid carrier containing water;
 - (b) applying a metathesizable material to the elastomeric substrate surface; and
 - (c) bringing the metallic substrate surface and the elastomeric substrate surface together to contact the catalyst and the metathesizable material and bonding said substrates together in a metathesis reaction at normal ambient conditions without an external energy source .
21. (original) A method according to claim 20 wherein step (c) occurs at room temperature.
22. (original) A method according to claim 20 wherein the elastomeric

substrate is a substantially cured elastomeric material.

23. (original) A method according to claim 1 wherein the catalyst is selected from at least one of a rhenium compound, ruthenium compound, osmium compound, molybdenum compound, tungsten compound, titanium compound, niobium compound, iridium compound and MgCl_2 .

24. (original) A method according to claim 23 wherein the catalyst is selected from a ruthenium compound, a molybdenum compound, iridium compound and an osmium compound.

25. (original) A method according to claim 24 wherein the catalyst has a structure represented by

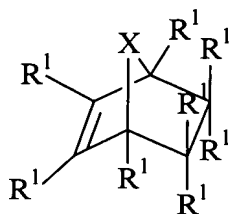


wherein M is Os, Ru or Ir; each R^1 is the same or different and is H, alkenyl, alkynyl, alkyl, aryl, alkaryl, aralkyl, carboxylate, alkoxy, alkenylalkoxy, alkenylaryl, alkynylalkoxy, aryloxy, alkoxycarbonyl, alkylthio, alkylsulfonyl or alkylsulfinyl; X is the same or different and is an anionic ligand group; and L is the same or different and is a neutral electron donor group.

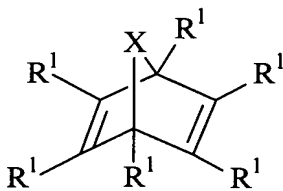
26. (original) A method according to claim 25 wherein X is Cl, Br, I, F, CN, SCN, or N_3 ; L is $\text{Q}(\text{R}^2)_a$ wherein Q is P, As, Sb or N; R^2 is H, cycloalkyl, alkyl, aryl, alkoxy, arylate or a heterocyclic ring; and a is 1, 2 or 3; M is Ru; and R^1 is H, phenyl, $-\text{CH}=\text{C}(\text{phenyl})_2$, $-\text{CH}=\text{C}(\text{CH}_3)_2$ or $-\text{C}(\text{CH}_3)_2(\text{phenyl})$.

27. (original) A method according to claim 26 wherein the catalyst is a phosphine-substituted ruthenium carbene.

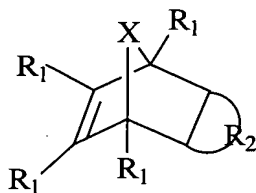
28. (original) A method according to claim 27 wherein the catalyst is bis(tricyclohexylphosphine)benzylidene ruthenium (IV) dichloride.
29. (original) A method according to claim 1 wherein the catalyst is stable in the presence of moisture and oxygen and can initiate polymerization of the metathesizable material upon contact at room temperature.
30. (original) A method according to claim 1 wherein the metathesizable material includes at least one reactive unsaturated functional group.
31. (original) A method according to claim 30 wherein the metathesizable material comprises an olefin.
32. (original) A method according to claim 31 wherein the metathesizable material is selected from ethene, α -alkene, acyclic alkene, acyclic diene, acetylene, cyclic alkene, cyclic polyene and mixtures thereof.
33. (original) A method according to claim 32 wherein the metathesizable material comprises a cycloolefin.
34. (original) A method according to claim 33 wherein the metathesizable material is a monomer or oligomer selected from norbornene, cycloalkene, cycloalkadiene, cycloalkatriene, cycloalkatetraene, aromatic-containing cycloolefin and mixtures thereof.
35. (original) A method according to claim 34 wherein the metathesizable material is a norbornene monomer or oligomer.
36. (original) A method according to claim 35 wherein the norbornene has a structure represented by



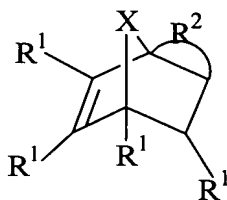
or



or



or



wherein X is CH_2 , CHR^3 , $\text{C}(\text{R}^3)_2$, O, S, N-R^3 , P-R^3 , O=P-R^3 , $\text{Si}(\text{R}^3)_2$, B-R^3 or As-R^3 ; each R^1 is independently H, CH_2 , alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl, halogen, halogenated alkyl, halogenated alkenyl, alkoxy, oxyalkyl, carboxyl, carbonyl, amido, (meth)acrylate-containing group, anhydride-containing group, thioalkoxy, sulfoxide, nitro, hydroxy, keto,

carbamato, sulfonyl, sulfinyl, carboxylate, silanyl, cyano or imido; R^2 is a fused aromatic, aliphatic or heterocyclic or polycyclic ring; and R^3 is alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl or alkoxy..

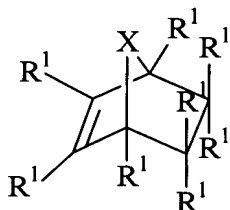
37. (original) A method according to claim 36 wherein the metathesizable material comprises ethyldenenorbornene monomer or oligomer.

38. (original) A method according to claim 1 wherein the metathesizable material comprises liquid ethyldenenorbornene monomer.

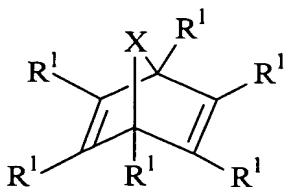
39. (original) A method according to claim 1 wherein the catalyst is applied in an aqueous solution or mixture and the metathesizable material is applied in the form of a liquid that is substantially 100 percent reactive.

40. (original) A method according to claim 1 wherein the method is substantially free of the use of volatile organic solvents.

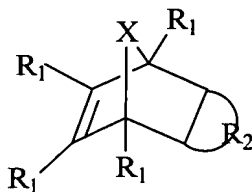
41. (original) A method according to claim 20 wherein the metathesizable material comprises norbornene monomer or oligomer having a structure represented by



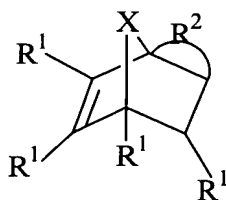
or



or



or



wherein X is CH₂, CHR³, C(R³)₂, O, S, N-R³, P-R³, O=P-R³, Si(R³)₂, B-R³ or As-R³; each R¹ is independently H, CH₂, alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl, halogen, halogenated alkyl, halogenated alkenyl, alkoxy, oxyalkyl, carboxyl, carbonyl, amido, (meth)acrylate-containing group, anhydride-containing group, thioalkoxy, sulfoxide, nitro, hydroxy, keto, carbamato, sulfonyl, sulfinyl, carboxylate, silanyl, cyano or imido; R² is a fused aromatic, aliphatic or heterocyclic or polycyclic ring; and R³ is alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl or alkoxy; and the catalyst is selected from a ruthenium compound, a molybdenum compound and an osmium compound.

42. (original) A method according to claim 41 wherein step (c) occurs at room temperature.

43. (original) A method according to claim 1 wherein step (a) comprises applying a ruthenium catalyst in a liquid carrier to the first substrate surface, step (b) comprises applying a metathesizable liquid norbornene monomer to

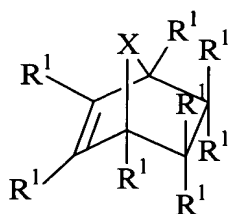
the second substrate surface and step (c) comprises contacting the catalyst-applied first substrate surface and the monomer-applied second substrate surface.

44. (canceled)

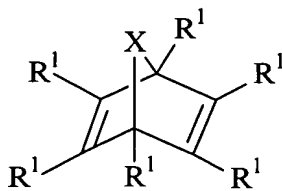
45. (withdrawn) A method according to claim 44 wherein step (c) occurs at room temperature.

46. (withdrawn) A method according to claim 44 wherein the tire tread comprises precured retread stock.

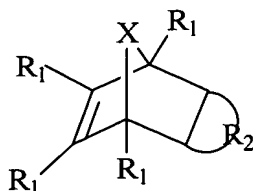
47. (withdrawn) A method according to claim 44 wherein the metathesizable material comprises norbornene monomer or oligomer having a structure represented by



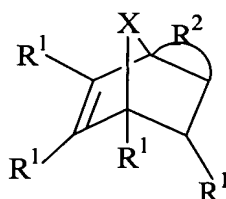
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or



or



wherein X is CH_2 , CHR^3 , $\text{C}(\text{R}^3)_2$, O, S, N-R^3 , P-R^3 , O=P-R^3 , $\text{Si}(\text{R}^3)_2$, B- R^3 or As- R^3 ; each R^1 is independently H, CH_2 , alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl, halogen, halogenated alkyl, halogenated alkenyl, alkoxy, oxyalkyl, carboxyl, carbonyl, amido, (meth)acrylate-containing group, anhydride-containing group, thioalkoxy, sulfoxide, nitro, hydroxy, keto, carbamato, sulfonyl, sulfinyl, carboxylate, silanyl, cyano or imido; R^2 is a fused aromatic, aliphatic or heterocyclic or polycyclic ring; and R^3 is alkyl, alkenyl, cycloalkyl, cycloalkenyl, aryl, alkaryl, aralkyl or alkoxy; and the catalyst is selected from a ruthenium compound, a molybdenum compound and an osmium compound.

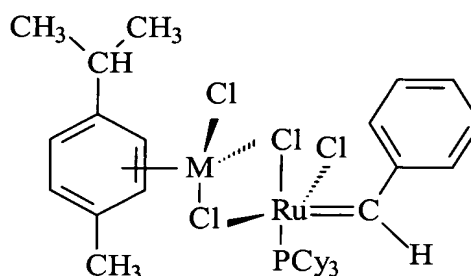
48. (withdrawn) A method according to claim [[44]] 99 wherein the catalyst is applied to the tire carcass and the metathesizable material is applied to the tire tread.

49. (currently amended) A method according to claim 13 wherein the catalyst is applied to said first substrate by way of applying said carrier and the carrier is dried so that ~~it is~~ said catalyst remains on the substrate surface in direct

contact with the first substrate surface.

50. – 94. (canceled)

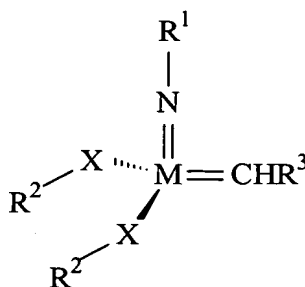
95. (original) A method according to claim 24 wherein the catalyst comprises
(original) A method according to claim 24 wherein the catalyst comprises a
bimetallic catalyst having a structure represented by



wherein M is Ru, Os or Rh.

96. (canceled)

97. (original) A method according to claim 24 wherein the catalyst has a
structure represented by



wherein M is Mo or W; X is O or S; R¹ is an alkyl, aryl, aralkyl, alkaryl,
haloalkyl, haloaryl, haloaralkyl, or a silicon-containing analog thereof; R² are
each individually the same or different and are an alkyl, aryl, aralkyl, alkaryl,

haloalkyl, haloaryl, haloaralkyl, or together form a heterocyclic or cycloalkyl ring; and R^3 is alkyl, aryl, aralkyl or alkaryl.